Webinar Brief for Resource Managers

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Assessing the Relationship between Ground Measurements and Aerial Image Analysis of Land Cover Classes in Pinyon and Juniper Woodlands

Presented on February 29, 2012 by April Hulet, PhD Candidate, Plant Ecologist, Brigham Young University

Project Summary: April Hulet and Dr. Bruce Roundy discuss recent findings from their research regarding digital imagery and land cover classifications for assessing rangeland health and fuel loads in the Great Basin pinyon and juniper woodlands.

Abstract: Changing vegetative landscapes in the Great Basin, especially the shifting of sagebrush steppe ecosystems to pinyon-juniper (PJ) woodlands, is a serious issue. A shift in vegetation towards PJ can result in a loss of understory vegetation which degrades ecological function, increases soil erosion/runoff/soil hydrophobicity, and increases the potential for devastating, intensive crown fires. The objectives of the study are to provide land managers with tools that allow them to assess vegetation composition and using their knowledge and expertise, help to restore these sagebrush steppe communities by way of testing the accuracy of object based image analysis (OBIA) cover measurements from high-spatial resolution imagery relative to ground-measurements on PJ woodlands where fuel-reduction treatments have occurred. To meet objectives, five sites were selected and divided into subplots with bullhog/prescribed fire/cut-and-drop fuel reduction treatments applied (while keeping controls); following selection, high-resolution areal imagery was collected, as well as on the ground measurements of cover values, then imagery was analyzed using OBIA and compared to on the ground measurements. Roughly 10% of subplots were used to create object classes of cover (PJ overstory, litter, perennials, shrubs, etc.) in the OBIA, then applied to the remainder of the sites. Four different spatial scales, ranging from individual sites, to subplots, to regional, and then full network, were established for comparison of accuracy. Results show an overall accuracy of 84%, and accuracy of individual cover classes were fairly close to the average. A few consistent inaccuracies, such as underestimating tree cover, not being able to distinguish litter from

Management Implications

- Remote sensing high-resolution imagery can produce usably accurate estimates of cover at a variety of spatial scales
- With improved methods and technology, other data (such as biomass estimates) that would have traditionally needed on the ground observations, can be done with remote sensing.

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invasive annuals in small patches, and confusing juniper edge with perennials, were present, but with advancements in technology and identification/improvement of methods that produce inconsistencies will improve accuracy. Doing landscape-level assessments, monitoring changing trends, reducing field collection of data, improving fuel mapping (and by extension, improving modeling of fire behavior), and evaluating longevity and need for reapplication of treatments are all possible with the level of accuracy obtained through OBIA. Hulet and Roundy also briefly explored using lower resolution public imagery, like NAIP, and Tausch biomass estimates, with promising results. Future research directions include improving fire behavior models, linking spatial scales, and evaluating different remote sensing platforms.

Questions:

Are you looking to do this type of work across the nation?
That seems a little overwhelming, but yes, I think that this template would work anywhere. We are primarily focused in the PJ area, but we are definitely interested in finding these tools that can be used for any kind of land management applications. We often monitor and assess large areas, so I think it could be very useful to do across the nation.

What do you plan to use for fire behavior models? The original 13, the Scott and Bergen 40, or FCCS (Fuels Characteristic Class System)?
We are definitely considering all of those, but also some other new ones that are coming out; the WFDSD, I think is what it's called, and also BehavePlus, which is typically used by a lot of our managers here in the Great Basin, and FarSITE is definitely one we are considering as well.